IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of
Serial No. 10/567,684
Akira TAKAYASU et al.
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Confirmation No. 2119
Group Art Unit: 2837
Examiner: Forrest M. Phillips

DECLARATION UNDER 37 CFR 1.132

Honorable Commissioner of Patents and Trademarks

Sir,

I, Kazuhiko Kosuge declare that:

I am a citizen of Japan and a resident in Tokyo, Japan;

I received Master of Science from Waseda University, Faculty of Science, Tokyo, Japan, in 1972;

I received my doctor degree on the study of "Modification and Application of PPTA fibers" at Fukui University, Fukui Prefecture, Japan, in 2005;

I had been employed by TORAY CO., LTD, Japan in 1972 and had worked at Films and Films Products Research Laboratories, and then had worked at Technical Development Division of Polyester Filament Fiber and Technical Development Division of Nylon Filament Fiber;

I had been an employee of DU PONT-TORAY CO., LTD, Japan, since 1995 until June, 2009;

In DU PONT-TORAY CO., LTD, I worked at "KEVLAR" Production Department, and then at "KEVLAR" Product & Application

Technology Department;

I had been a Director of Technology & New Business Development and developed a new sound-absorbing and sound-insulating non-woven fabric, a new flame retardant, and aramid fiber thermoplastic composite, etc.

Since June, 2009 up to this time, I have been developing a new sound-absorbing and sound-insulating non-woven fabric, etc. as an employee on a short-term contract in DU PONT-TORAY CO., LTD, Japan.

I reported the following papers;

1. K. Kosuge:
   "Studies on the Sound Absorption Properties of Paper Attached to Non woven Fabric and the Specific Role of the Paper in Sound Absorption"
   Journal of the Society of Fiber Science and Technology, Japan (Sen-i Gakkaishi), published by The Society of Fiber Science and Technology, Japan, Vol.62, No.1, p.12 (2006)

2. K. Kosuge, A. Takayasu and T. Hori:
   "Recyclable Flame Retardant Non-woven for Sound Absorption; Ruba®"
   Journal of Materials Science, vol. 40, No. 20, pp. 5399-5405 (2005)

The experiment set out below was conducted under my supervision.

Experiment

1. Samples

(1) Non-woven fabric

A non-woven fabric was prepared in accordance with the procedure described in Example 10 of the present specification.

(2) Surface material

As a surface material, "100% polyester paper" (thickness: 80 μm, weight: 43.8 g/m^2, air permeability: 18 cc/cm^2/sec) manufactured by OJI SPECIALTY PAPER Co., Ltd. was used.

Both of the non-woven fabric and the surface material were 40-mm in diameter.

(3) Bonding of the non-woven fabric and the surface material

A double-faced adhesive tape manufactured by NICHIBAN CO., LTD under the trade name of "nicetack ®" was cut into 2 to 5-mm in widths to make small pieces of tape. These tape pieces were stuck on the surface material (100 % polyester paper) so that the tape pieces were uniformly and evenly supplied on the surface material. The resultant surface material was layered to one of the sides of the non-woven fabric and thus, the surface material and the non-woven fabric were bonded with the tape pieces to make a sound-absorbing material. In the sound-absorbing material, the areas where the tape pieces were stuck were bonding points. In preparing sound absorbing materials, a degree of bonding between the surface material and the non-woven fabric, i.e. "the ratio of the total surface area of bonding points to the total surface area of bonding points and non-bonding points", was controlled by varying the ratio

of the area where the tape pieces were stuck.

When, "the total area where the tape pieces were stuck", is defined as "A" and "the whole area of the surface material" is defined as "A+B", the ratio of the total surface area of bonding points (B) to the total surface area of bonding points and non-bonding points (A+B) is represented by the formula: $\{B/(A+B)\} \times 100$ (%). Hereafter, the term "the ratio of the total surface area of bonding points to the total surface area of bonding points and non-bonding points" is briefly omitted to "the ratio of bonding area". Therefore, that "the ratio of bonding area was 100%" meant that the non-woven fabric was bonding on the whole of the surface material, i.e. the tape pieces had been stuck all over the surface material. On the other hand, that "the ratio of bonding area was 0%" meant that the non-woven fabric and the surface material were not bonded at all, i.e. no tape piece had been stuck on the surface material. A sound absorbing material in which the non-woven fabric and the surface material were not bonded (i.e. the ratio of bonding was 0%) was used as a control. In the area where the tape pieces had been stuck, an air permeability was lost.

"The ratio of bonding area" in the prepared sound absorbing materials is shown in Table 1.

Table 1

	Ratio of bonding area
Control	0%
Sound absorbing materials of the present invention	15%
	27%
	30%
Comparative sound absorbing materials	100%

2. Test Methods

The normal incidence sound absorption coefficients of the sound-absorbing materials were measured in accordance with the procedure described in Examples of the present specification.

The areas under the graph of the normal incidence sound absorption coefficient between 0 to 5000 Hz were calculated using a planimeter, PLANIX 7 (trade name, TAMAYA DIGITAL PLANIMETER Inc.).

3. Test Results

The normal incidence sound absorption coefficients of the sound-absorbing materials were shown in Table 2.

Further, when the normal incidence (%) of sound absorbing materials is used in a vertical axis and 1/3 Octave band frequency (Hz) is used in a horizontal axis to make a graph, the area under the graph of the normal incidence of a sound absorbing material (%) between 0 to 5000 Hz is the sum total of the normal incidence sound absorption coefficients between 0 to 5000 Hz. In general, the larger the area under the graph of the normal incidence sound absorption coefficient between

a certain wavelengths is, the higher the performance of absorbing sound over the wavelengths is.

The areas under the graph of the normal incidence sound absorption coefficient between 0 to 5000 Hz were shown in Table 3.

Table 2

	1/3 Octave band frequency (Hz)	Ratio of bonding area				
		0%	15%	27%	30%	100%
Normal incidence sound absorption coefficient (%)	100	5.8	5.9	5.8	5.6	5.9
	125	4.6	5.2	4.7	5.1	4.7
	160	5.7	5.8	5.8	5.7	5.3
	200	6.4	6.8	6.7	6.6	6.4
	250	6.9	6.9	7.4	6.8	8.8
	315	6.1	6.1	6.4	5.9	8.5
	400	7.9	7.5	7	7.2	9.3
	500	9.6	9.4	8.6	9.3	11.2
	630	10.4	11.5	10.6	10.6	14
	800	11.2	11.3	12.9	12.9	19.5
	1000	15.5	16.6	17.8	19.5	31.5
	1250	24.4	23.8	24.9	26.6	50.8
	1600	36	36.4	38.7	42.1	81.3
	2000	50	55.8	63.4	66.1	88.9
	2500	59.3	62.4	69.9	72.2	85.3
	3150	84.7	85.2	87	84.2	45.8
	4000	96.6	96.3	94.7	96.5	26
	5000	99.8	99.8	98	97.4	18.4

Table 3

Ratio of bonding area	Area under graph
0%	72.5
15%	73.2
27%	75.1
30%	76.8
100%	54.7

As is clear from Table 3, the sound absorbing material of the present invention exerted a higher effect of absorbing sound as compared with comparative sound-absorbing material.

Further, as is clear from Table 2, the sound absorption coefficient of comparative sound-absorbing materials remarkably decreased in high frequency sound (more than 2500 Hz). For example, when the ratio of bonding area was 100%, the sound absorption coefficient was 18.4 % at 5000 Hz. On the other hand, at 5000 Hz, the sound absorption coefficient of the sound-absorbing material of the present invention was five or more times higher than that of comparative sound-absorbing material with the ratio of bonding area 100%. Therefore, the sound absorbing material of the present invention exerted a higher effect of absorbing sound as compared with comparative sound-absorbing material, particularly in high frequency sound.

4. Conclusion

As is clear from Tables 2 and 3, the sound absorbing material of the present invention exerted a higher effect of absorbing sound as compared with comparative sound-absorbing

material. Especially, the sound absorbing material of the present invention exerted a quite higher effect of absorbing relatively high frequency sound (that is, sound of more than 2500 Hz) as compared with comparative sound-absorbing material.

Therefore, the results clearly demonstrate that the sound absorbing material of the present invention is excellent in sound absorbency by restricting the ratio of bonding area to not more than 30%.

It is declared by the undersigned that all statements made herein of undersigned's own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issuing thereon.

This 16 day of October, 2009

Kazuhiko Kosuge

Kazuhiko Kosuge,